

Effect of auditory stimulation on traumatic coma duration in intensive care unit of Medical Sciences University of Mazandarn, Iran

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ABSTRACT

Background: Sensory deprivation is one of the common complications of coma patients in the intensive care unit (ICU). The purpose of this study was to investigate the impact of a familiar voice to consciousness level in coma patients. **Methods:** A total of 13 patients with traumatic coma ($8 \geq$ Glasgow's coma scale [GCS]) admitted in ICU ward were randomly assigned to control and experimental groups. The experimental group was treated twice a daily each time 15 min with a familiar recorded MP3 sound for 2 weeks. The control group received only natural voices of environment. GCS applied to evaluate patients' level of consciousness. **Finding:** Findings showed that duration to reach GCS = 15 was significantly shorter in the experimental group ($\chi^2 = 12/96, P < 0/001$). **Conclusion:** These findings imply that providing familiar auditory stimulation programs for coma patients in the ICU could be effective.

Key words: Auditory stimulation, coma patients, traumatic brain injury

INTRODUCTION

Traumatic brain injury (TBI) is brains acquired injury due to an external power with a different intensity from mild to severe.^[1] The Center of Disease Control and Prevention is referred to TBI as the silent epidemic. High age is one of the risk factors, which is effective on the severity of disease after TBI.^[2] According to the Statistical Center of Iran, in our country accidents are the most common cause of TBI.^[3] Recent advances in medicine and expanding and improving health care services have been led to reduce mortality due to TBI. Although these advances can save lives, but there is no guarantee for these patients to back to prior health level. This has caused increasing the number of patients seeking disability after severe brain injury.^[4] In the United States spending an average of \$1995 for inpatient, \$105 823 for acute care and 58,415 dollars per patient cost for rehabilitation. The annual cost of caring from patients with brain injuries is about 15/6 billion dollars.^[5] Coma is one of

the results of brain injuries.^[6] On the other hand, sensory deprivation is one of the complications, which have a high risk in intensive care unit (ICU) wards for these patients. Cause of nature of illness they are keeping in emphatic environments that it could lead to decreasing sensory inputs and in this condition brain does not have a normal level of brain activity and consequently would lead to sensory deprivation.^[7] Being ensure that environmental stimuli are sufficiently significant is the rational methods of nursing practice for patients who are at risk of sensory deprivation. Providing auditory stimulus is very important for people who are affected severely by sensory deprivation.^[8] The majority of patients with normal brain stem auditory evoked response are able to hearing. There is no evidence that used sensory stimulation program to increase arousal and awareness in patients is harmful.^[9] In term of nursing, coma patients in all aspects of care are dependent.^[5] Since, the patient is anesthetized without the body's protective reflexes; the nursing care of patients is the essential principles of recovery. In other words, patient survival during this stage, more than medical interventions is related to nursing care. In the ICU, all is carried out by nurse's care for coma patients. And in compare of other patients coma and confuse patients are needed to care by a holistic approach. It is necessary that all aspects of physiological and psychological functions of the patients considered by nurse. Even if the client is not able to response to the environment the nurse should care his in a worthy manner.^[10]

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Considering the emphasis of using of complementary therapies in health systems and executable of auditory stimulation program for a wide range of patients in coma, this study proceeded to investigation of effect of auditory stimulation on the reaching time to Glasgow's coma scale (GCS) = 15 level in traumatic coma patients hospitalized in ICU centers of Mazandaran University of Medical Sciences, in 2011 during 14 days to application of auditory stimulation.

METHODS

This study was a double-blind randomized clinical trial. The proposal of this study is approved by the Ethics Committee of Mazandaran University of Medical Sciences by registration number 9039. The study population included 30 patients hospitalized because of traumatic coma in the ICU of Mazandaran Hospitals during 2011. Sampling lasted about 6 months and patients were assigned randomly into control and experiment groups.

The exclusion criteria were: The history of previous brain injury, impaired hearing, blood or cerebrospinal fluid excretion from ears and nose at the time of trauma, skull fractures in the temporal area, bleeding in the area (according to computed tomography-scan) and surgery in this area, diabetes, heart disease-vascular and fat embolism, history of drug addiction, fractured in four limbs (arms and legs), swelling in both eyelids.

Information gathering tools included a demographic characteristics questionnaire, clinical status form, vital signs records and consciousness level form based on GCS, which reviewed by five experts. GCS already validated in Iran by Tehran university professors. GCS is a major tool to measure the consciousness level in coma patients and its validity and reliability have been confirmed in many studies (Cronbach's alpha 96% and coefficient of 94%). Coma patients who meet inclusion criteria went under study 24 h after recording their baseline vital signs. In the experimental group (auditory stimulation by familiar voice) patients received a recorded 10-min MP3 voice of a loved one twice a day for 2 weeks. The recorded voice contained introducing speaker, place and time, what had happened and sweat memories and some sentences about recovery and coming back to family in the future? These voices played for patients by head phone. And the patient name repeated at least 3 times during the recorded voice. GCS recorded before and after auditory stimulation. In the control group, GCS was recorded in the same manner. In both groups, the patients shouldn't be touched during study. The nurse who assesses the patient's GCS and vital signs doesn't have information about study. Given the low-level of consciousness, the consent forms signed by their family.

For data analysis were used descriptive statistics (mean, frequency, percentage) and inferential statistics (Test Rank Log) methods.

FINDING

Averages of consciousness level in subjects before the 1st day of the study in the intervention and control groups were 6.4 and 5.53 respectively. The ANOVA test shows that the average level of consciousness before intervention was not statistically significant difference ($P = .02$) [Table 1].

Log Rank test was used to compare the time to reach to GCS = 15. Log rank test showed that the amount of time to reach GCS = 15 with $\chi^2 = 12.96$ statistics, there is a significant difference ($P < .0001$) [Table 2].

CONCLUSION

As we expected, the 1st day (baseline) means scores of the groups in consciousness were equivalent and no significant differences were reported. Results showed that a highest percentage of subjects in the intervention group were 35 to 44-year-old and in control group age range was 15 to 24.

In Goudarzi *et al.* study also, the majority of patients with traumatic coma were 25 to 44 year-old.^[3] In Togha

Table 1: Comparison of consciousness level of the subjects in both intervention and control groups in selected patients admitted to the IC before intervention in 1st day

Group	N	Mean	SD	Mean differences		Results of ANOVA
				Upper	Lower	
Intervention group	15	6.40	1.53	7.14	5.56	ANOVA=1.66, df=2.44, P=0.202
Control group	15	5.53	5.53	1.54	5.53	

IC: Intensive care

Table 2: Comparison of time to reach GCS=15 and control group of admitted patients in educational centers of Mazandaran University of Medical Sciences in 2011

Group	N	Mean	SD	Mean differences		Results of Log Rank
				Upper	Lower	
Intervention group	15	6.46	1.53	4.71	8.21	Log Rank test, $\chi^2=12.96$, df=1, P<0.001
Control group	15	12.26	5.53	10.77	3.76	
Total	30		30	7.81	0.91	

GCS: Glasgow's coma scale

and *et al.* highest prevalence of traumatic coma patients was between 21 and 40 years.^[11] Similarly, in Soleimani, Shadfar Togha and Goudarzi study males were the majority. Zahra Moshtag stated that accidents were the most common cause of head injuries and the majority of victims are men under 30.^[10]

Moshtag showed that 15-19 teenagers have a high risk of TBI; this risk in men is 2 times more than women.^[12] In this study time to reach GCS = 15 was different in intervention and control groups and intervention group reached to consciousness in shorter time than the control group [Figure 1]. Few studies assessed the time to reach the level of consciousness after employing a variety of auditory stimuli, so it is difficult to compare these results with other similar studies. Providing an auditory stimulus to coma patients Goudarzi *et al.* recorded daily changes in consciousness level of experimental and control groups for 14 days. The groups were significantly different ($P < 0.001$) so that the experimental group had better scores. In other words, the stimuli may explain these differences.^[3] Soleimani, in a similar study found a significant difference between experimental and control groups ($P = 0/05$) besides that consciousness in the control group had been decreased over time.^[4] Abbasi *et al.* investigate the effect of auditory and touching inputs in addition to meeting family members on coma patients. They found that consciousness level in the intervention group was significantly higher than the control group ($P < 0.001$).^[4] Avstyk and Sasnovsky's research on women with brain injury showed that sensory stimulation program led to a prominent improvement on the consciousness level during 10 days of intervention. They recorded patients' behavioral functions that changed from 2 to 4 and consciousness level that changed from GCS 3-5 to GCS 8-9.^[15] Seo's also showed that the average of daily GCS among patients had downside slope within a month

before the intervention. Two weeks after applying the first 4-week program of sensory stimulation (stimulating several senses, including vision, audition, olfactory, taste, tactual, physically) the average of consciousness level significantly increased. During the interval period (4 weeks), however; GCS in patients decreased, but after starting the second intervention, consciousness level increased again and reached to be highest level over 2 months after intervention. Statistical analysis showed a significant increase in patients' consciousness through crossover periods.^[16] Karma and Ravat also reported significant improvements in patients' consciousness level in their intervention group.^[17]

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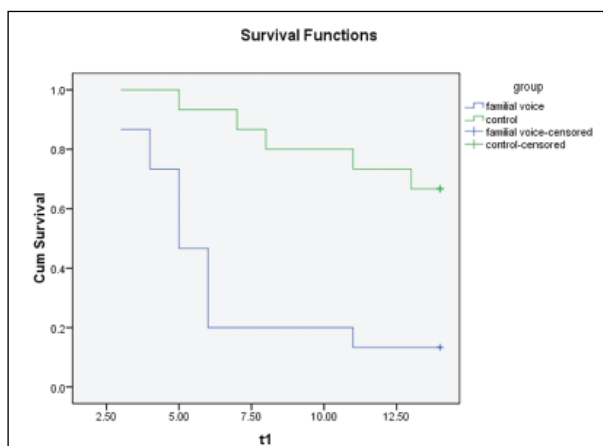


Figure 1: Comparison of time to reach Glasgow's coma scale = 15 the intervention and control groups in intensive care unit of educational centers of Mazandaran University of Medical Sciences 2011

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